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(58) Field of search

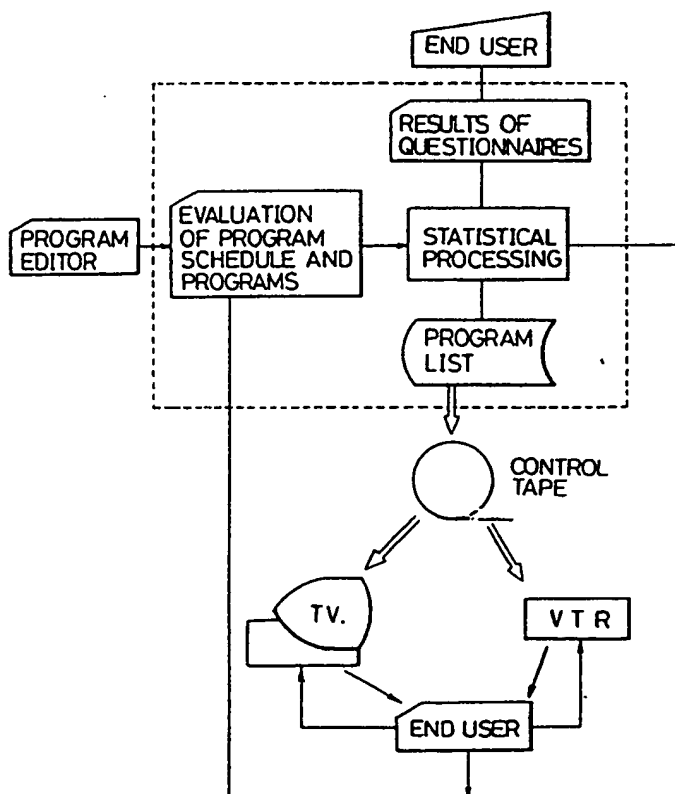
G4A

Selected US specifications from IPC sub-class G06F

(54) Method of editing individual television programs and apparatus therefore

(57) Apparatus for editing a table of television programs for provides a list in units of time intervals and TV channel numbers for each of a plurality of subscribers. Each subscriber indicates his preferred material for viewing by means of a completed questionnaire. Programme makers indicate the nature of the program contents by means of a completed program evaluation questionnaire. Objective data are derived statistically by linear programming of the questionnaires. The processed results are input to a computer and are preferably stored on a hard disk. The storage contents are read out from the hard disk and are printed out. Subscriber complaints about the program list are fed back periodically to improve prediction precision. An automatic controller attuned to subscriber taste results when the individual subscriber program list is used to control automatically a TV or video tape recorder.

FIG.2



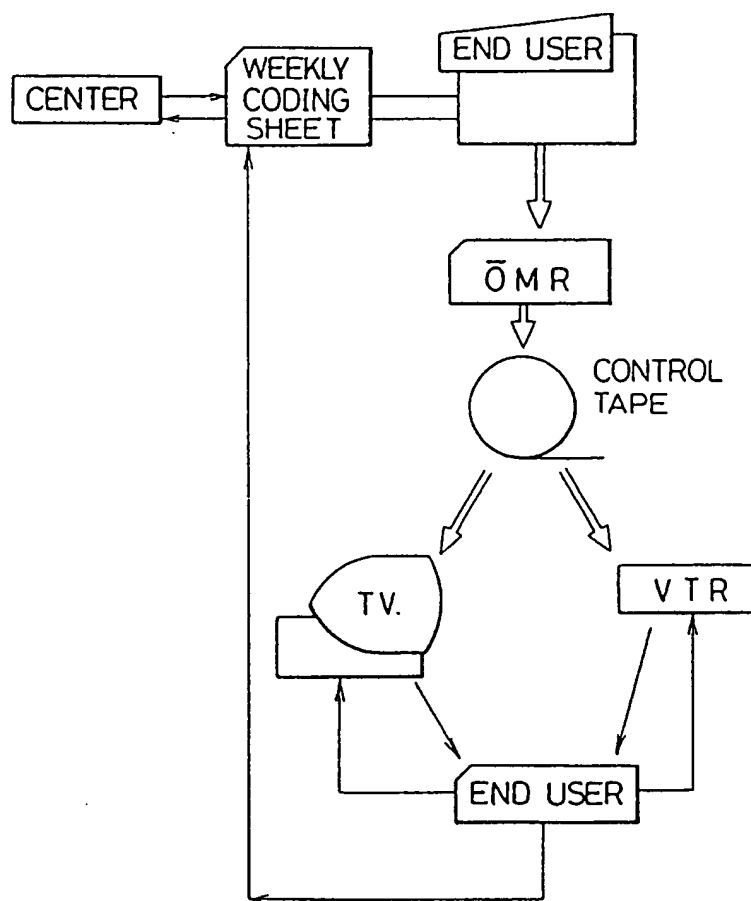
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FIG. 1



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FIG. 2

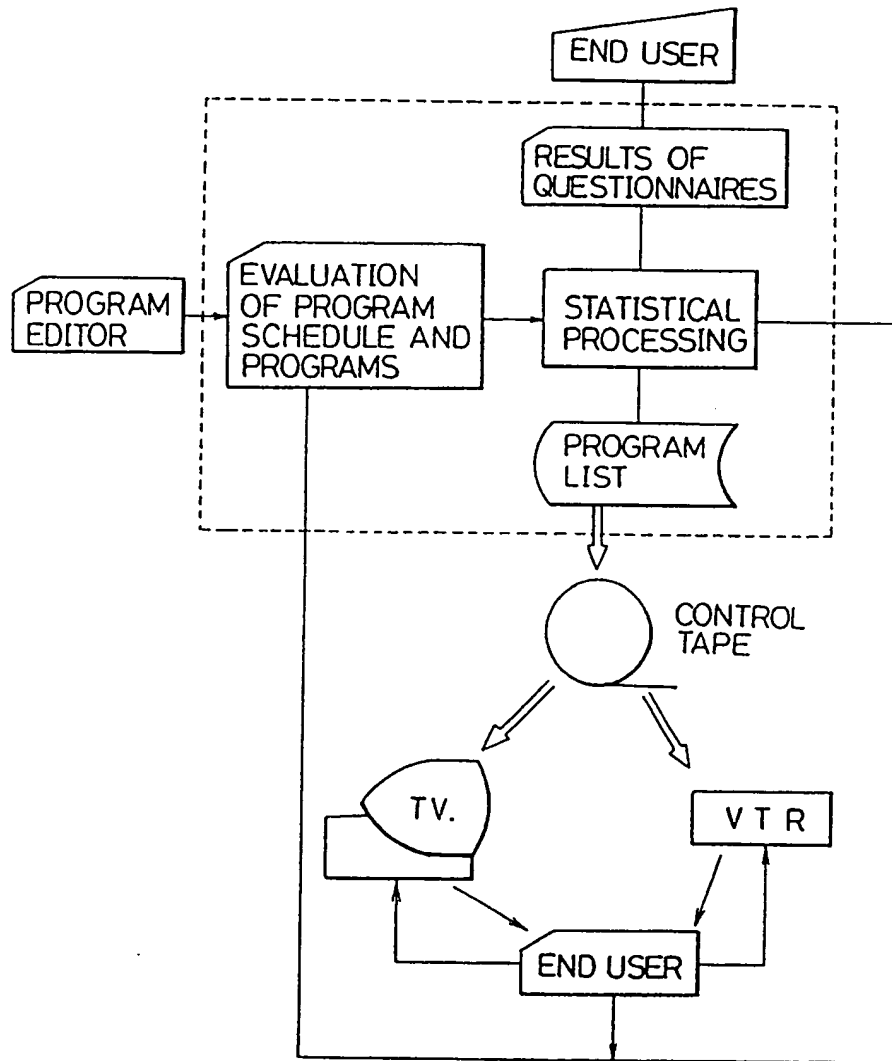


FIG. 3

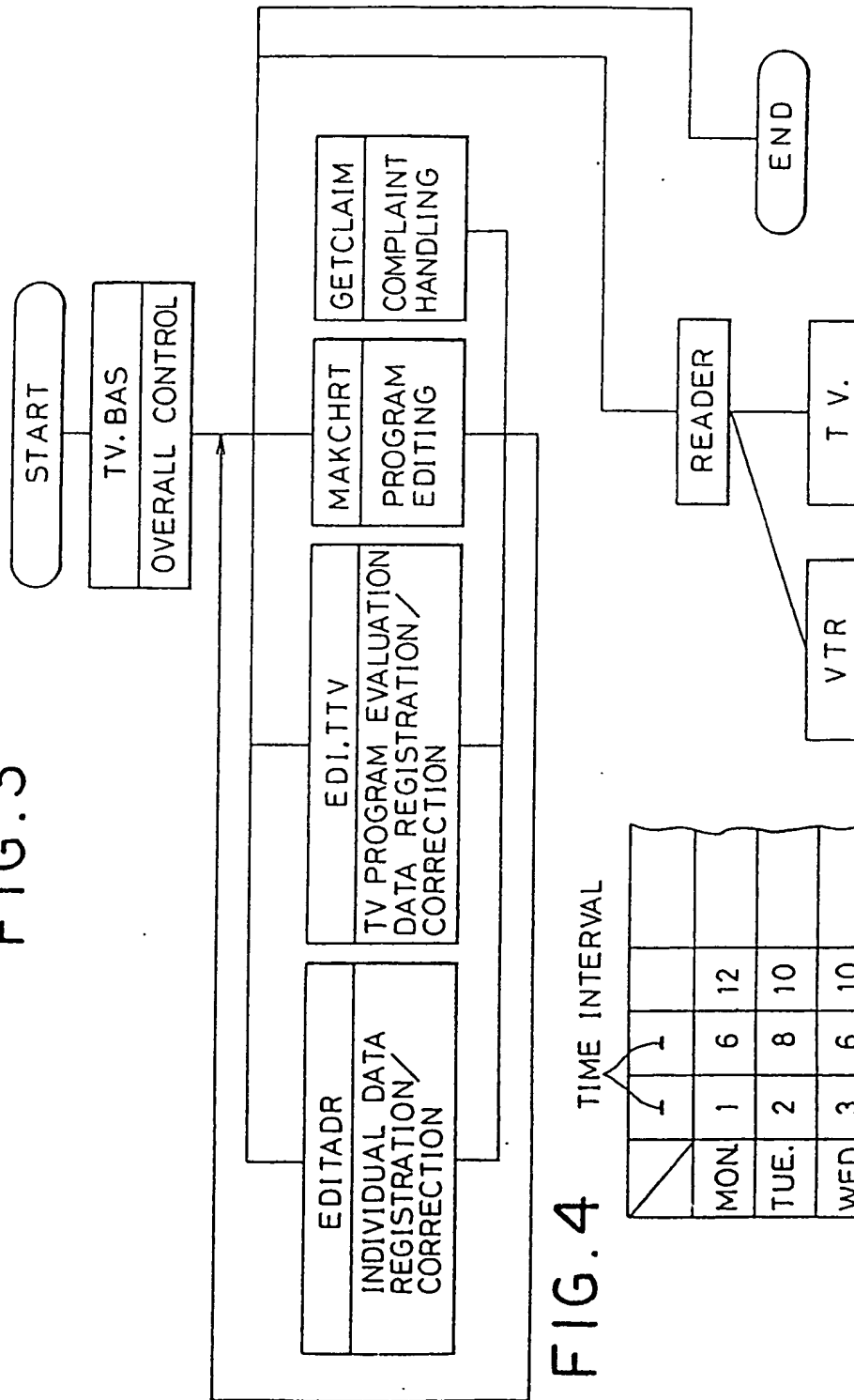


FIG. 4

TIME INTERVAL

	1	6	12	
MON.	1	6	12	
TUE.	2	8	10	
WED.	3	6	10	

CHANNEL

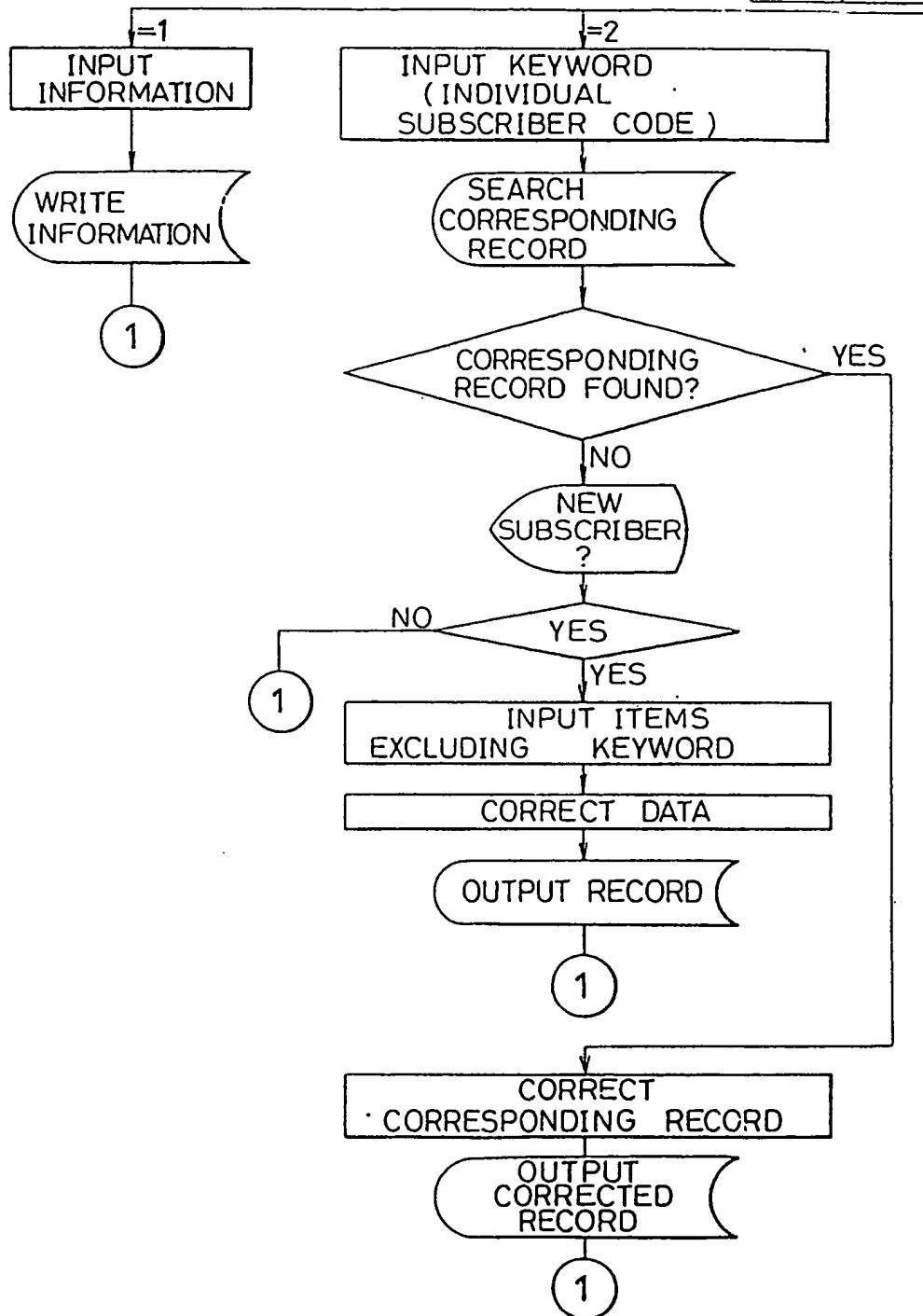
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FIG. 5A

FIG. 5

FIG 5A FIG 5B



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FIG. 5B

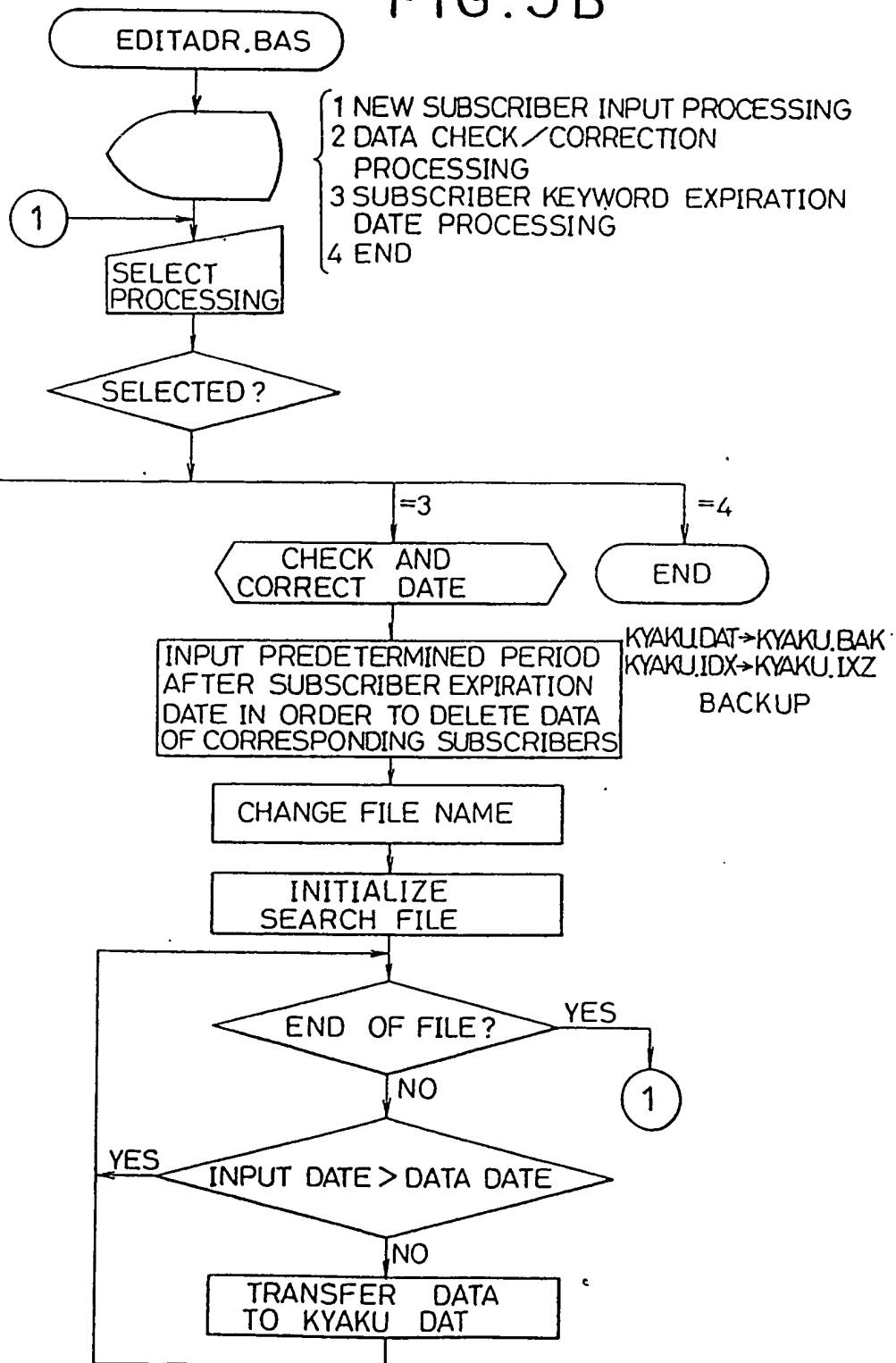
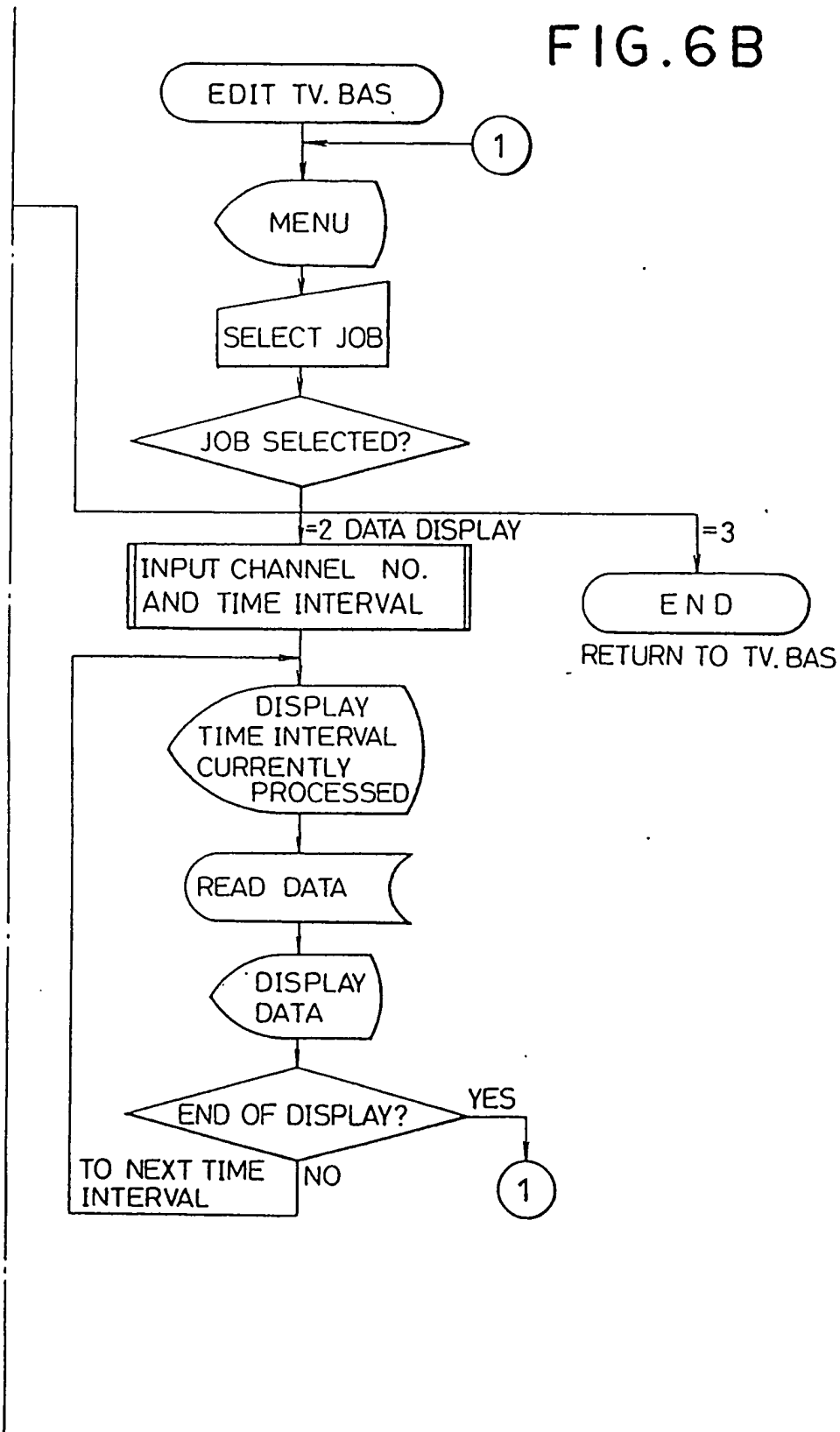


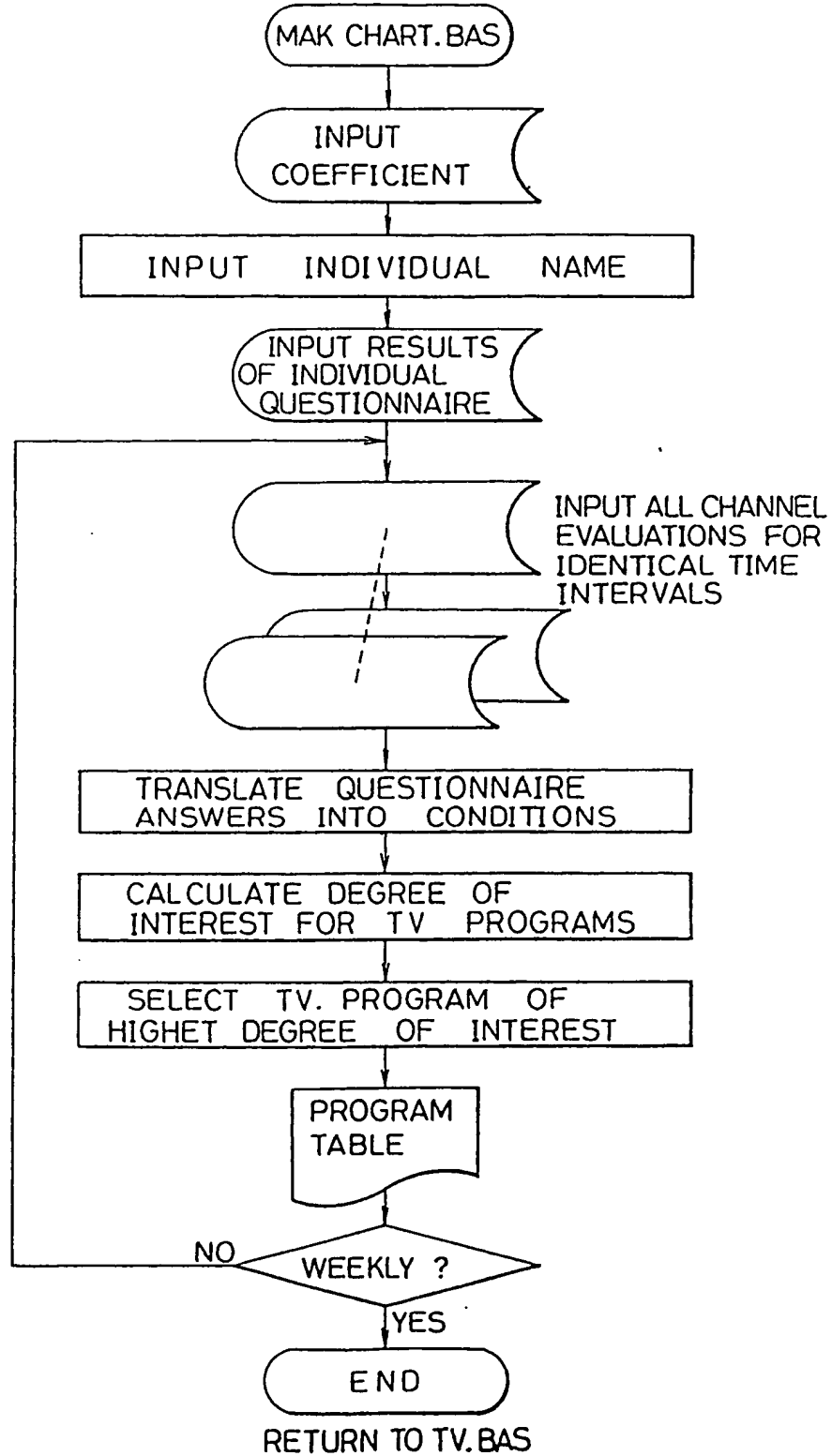
FIG. 6B



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FIG. 7



[illegible]

AFTERNOON	12	1	2	3	4	5	6
	00153045	00153045	00153045	00153045	00153045	00153045	00153045
	12121212	111111	110101010	6666	3333	3333	4444
	12121212	111111	110101010	6666	3333	3333	4444
	12121111	111111	110101010	6666	3333	3333	4444
	333333	111111	110101010	6666	3333	3333	4444
	666666	111111	110101010	6666	3333	3333	4444
	444444	111111	110101010	6666	3333	3333	4444
	888888	111111	110101010	6666	3333	3333	4444

7	8	9	10	11	12
00153045	001530	0015304500	15304500	15304500	15304500
4444	3333	661111	110101010	6666	3333
4444	3333	661111	110101010	6666	3333
4444	3333	661111	110101010	6666	3333
3311	121212	111111	111144	410101010	8888
3311	121212	111111	111144	410101010	8888
10101010	6666	441111	111188	884444	1111
10101010	6666	441111	111188	884444	1111
12121212	6666	441111	111188	886666	4444

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FIG. 9A

- 1.COMPLAINT RECEPTION
PROCESSING
- 2.COMPLAINT PROCESSING
/END
- 3.COMPLAINT PENDING
/END

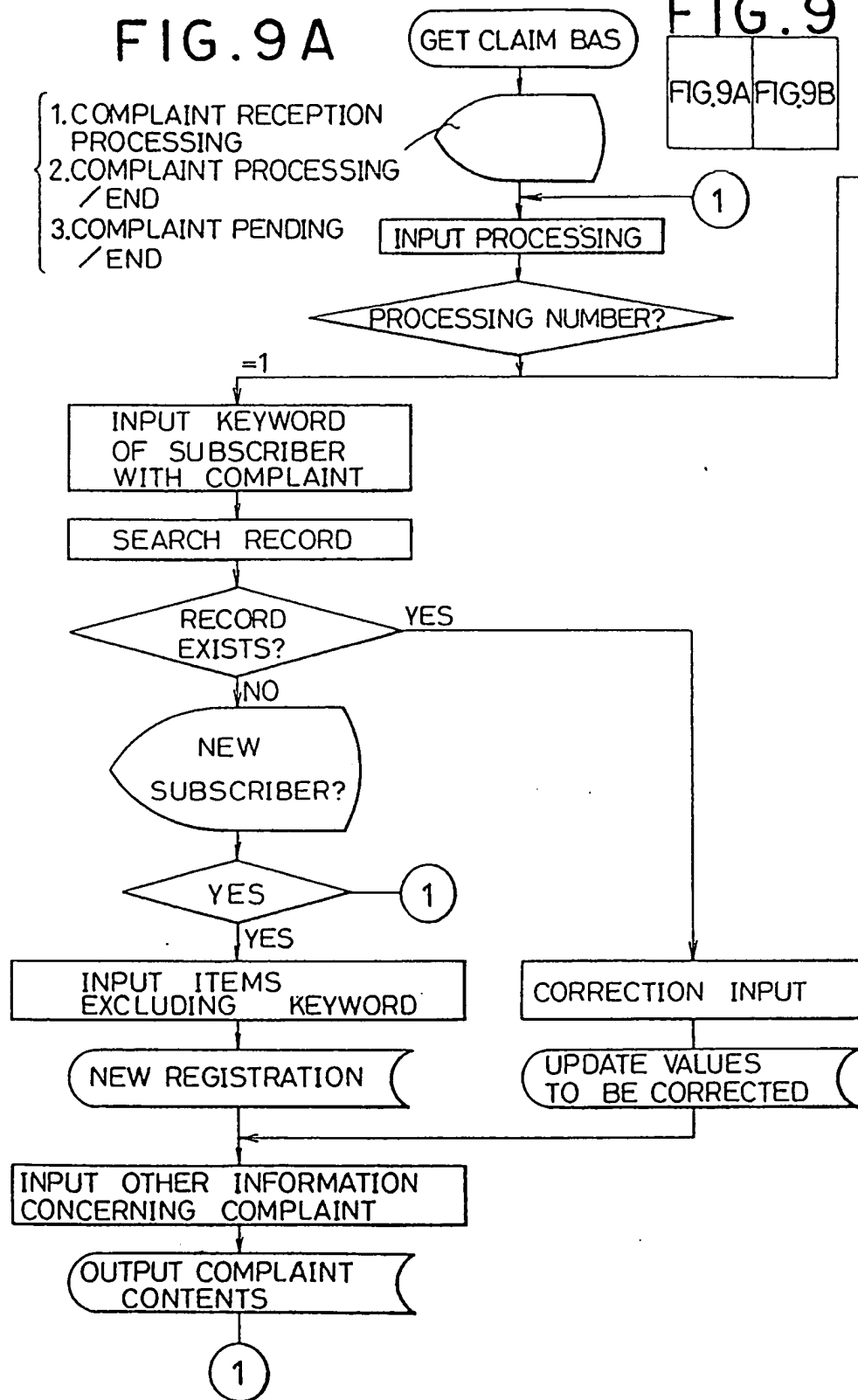
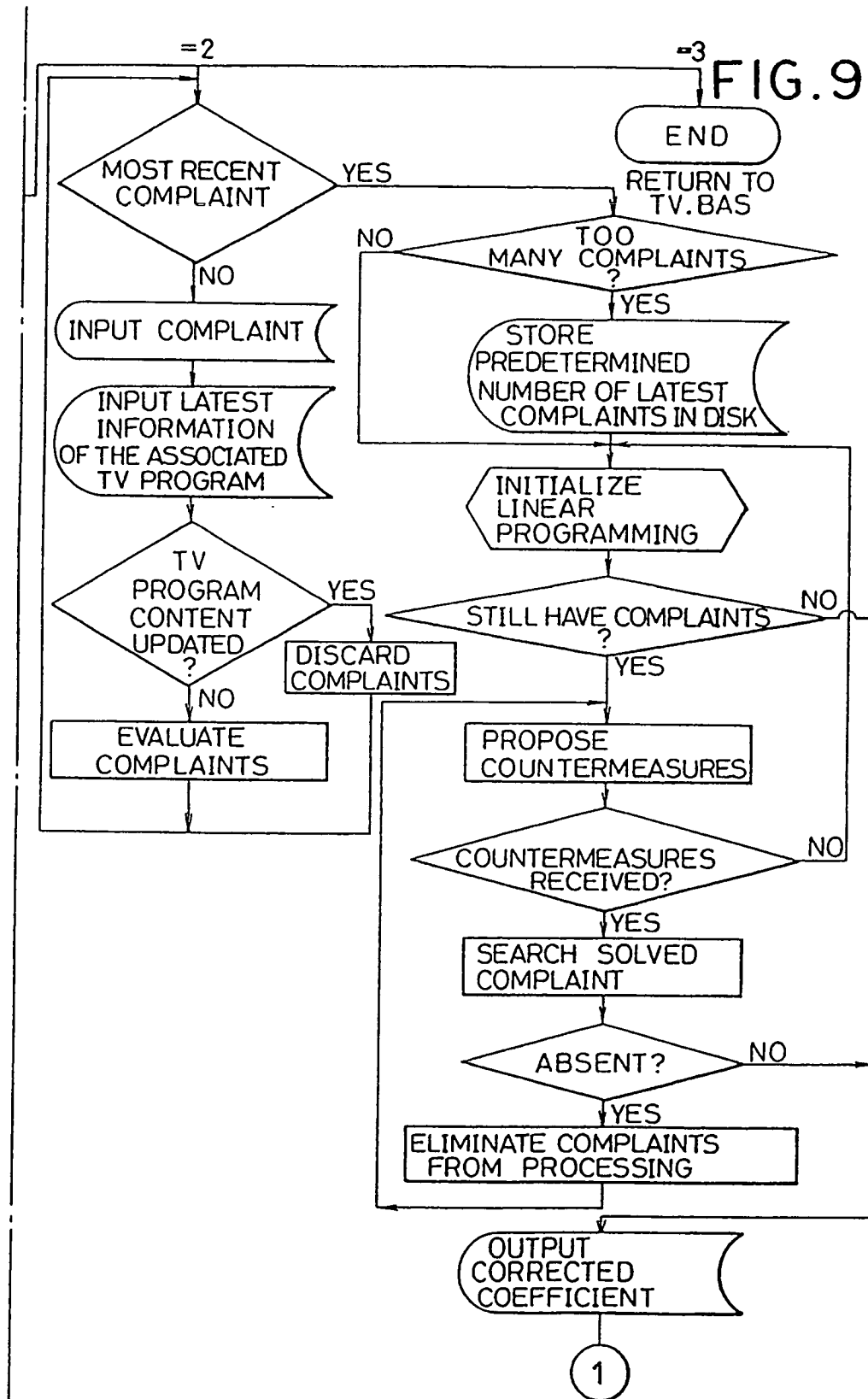


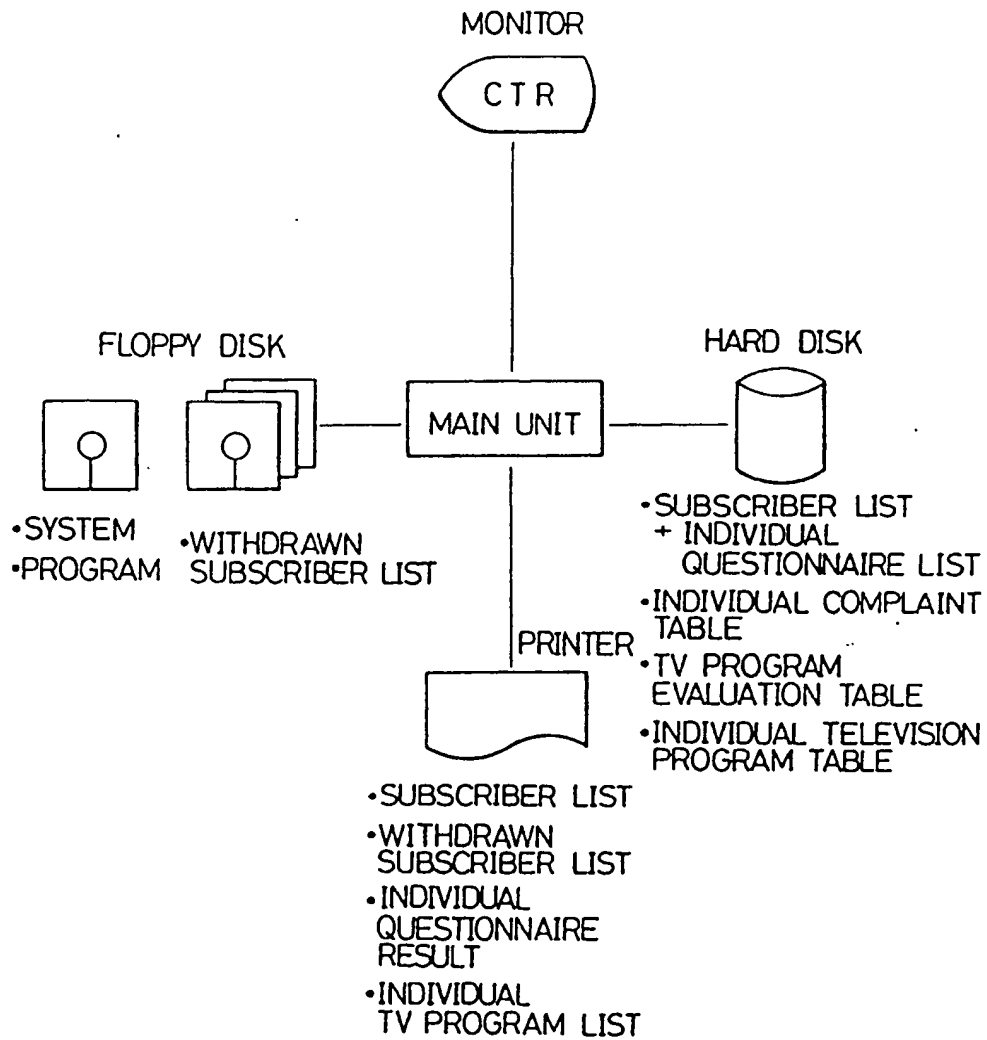
FIG. 9B



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FIG. 10



SPECIFICATION

Method of editing individual television programs and apparatus therefore

- 5 The present invention relates to editing of an individual television program according to linear programming, a method of automatically controlling a program rating, and an apparatus therefor. 5
- In order to implement such an apparatus according to conventional techniques, a program editor selects suitable programs reflecting a customer's taste from among all available television programs by utilizing subjective knowledge according to the results of questionnaires filled by end users (customers). In this case, the programs are selected on at least a once-per-week basis. The programs are listed and printed out in a tape-like table (to be referred to as a table hereinafter) according to the channel numbers and time intervals. The TV or VTR is then automatically set according to this table. Japanese Patent Publication Nos. 41-8542, 42-1882, 53-40340, and 59-21114 issued to the present applicant are concerned with the above conventional system. 10 15
- It is an object of the present invention to edit an individual television program list which is formed on the basis of objective decision and which satisfies a customer.
- It is another object of the present invention to provide a method and apparatus for editing individual television program lists in a short period of time, even if many customers simultaneously order the lists. 20
- It is still another object of the present invention to eliminate subjective opinions of an editor when he selects programs suitable for the tastes of customers from among all available television programs.
- It is still another object of the present invention to provide a method employing linear programming for questionnaires and program evaluation and adopting a technique for feeding back complaints against the evaluation results, thereby improving satisfaction of the customers in the individual television programs listed by the editor. 25
- It is still another object of the present invention to edit a control tape for controlling an automatic controller incorporated in a TV or VTR according to the program list.
- 30 In order to achieve the above objects of the present invention, the present invention is constituted by a method comprising the steps of: statistically processing objective data according to linear programming; inputting processed results in a computer, storing them on a hard disk, and printing out the contents therein; and periodically feeding back complaints to be compared against the processing results to improve reliability of the data. The preferred embodiment also includes editing of a control tape. The functional system diagram is shown in Fig. 2. 35
- Embodiments of the invention will now be described by way of example only and with reference to the accompanying drawings, in which:
- Figure 1* is a block diagram of a conventional system;
- Figure 2* is a block diagram of a system according to the present invention;
- 40 *Figure 3* is a diagram showing a computer program according to the present invention;
- Figure 4* is a table showing the relationship between time intervals, days, and television channel numbers according to the results of questionnaires;
- Figure 5* is a flow chart for processing questionnaire information (subscriber data registration);
- Figure 6* is a flow chart of television program evaluations;
- 45 *Figure 7* is a flow chart for editing television programs according to linear programming;
- Figure 8* is a table showing an output of a television program table;
- Figure 9* is a flow chart for processing a complaint;
- Figure 10* is a diagram of components associated with a computer according to the present invention; and
- 50 *Figures 11(a), 11(b), 11(c), and 11(d)* are all programs processed by the computer. 50
- The present invention is constituted by a means for evaluating questionnaires collected from end users, a means for evaluating all available television programs, a means for calculating the evaluation results according to linear programming and editing data (a television program list for time intervals and channel numbers in a form suitable for each customer), a means for inputting the data in a computer and causing the computer to calculate the data, a means for temporarily storing an output from the computer, a means for printing out each individual television program list (to be referred to as a program list hereinafter) according to the storage contents, a means for feeding back complaints against the first printed-out program list, and a means for automatically controlling a TV or VTR according to the program list. The constitution of the present invention described above is expressed as a program diagram in Fig. 3. 55 60
- Although hardware associated with the above operations is added to constitute the entire system, a control tape is finally edited to control an automatic controller incorporated in a TV or VTR. This is known in conventional systems to those skilled in the art, and since it is not directly associated with the present invention, a detailed description thereof will be omitted. The structures the operations of the means described above will be described below: 65

(1) Subscriber Questionnaire Result Input Means

Fig. 4 shows one form of questionnaire used as a questionnaire result input means for extracting and representing individual tastes. Referring to Fig. 1, the leftmost column represents 5 days of the week, and the uppermost row represents time intervals (in units of 15 minutes). Television channel Nos. are respectively filled at intersections of corresponding rows and columns. A basic questionnaire for editing the list described above is exemplified below:

-- Subscriber Questionnaire --

- | | | |
|----|---|----|
| 10 | Q1: Are you married or single? | 10 |
| | 1. Single | |
| | 2. Married without children | |
| | 3. Married with children in the age group of 0 to 6 years old | |
| | 4. Married with children in the age group of 7 to 12 years old | |
| 15 | 5. Married with children in the age group of 13 years old or more | 15 |
| | Q2: What is your age group? | |
| | 6. 25 years old or less | |
| | 7. 35 years old or less | |
| 20 | 8. 45 years old or less | 20 |
| | 9. 55 years old or less | |
| | 10. 56 years old or more | |
| | Q3: Do you watch NHK (Nihon Hosō Kyōkai) programs? | |
| 25 | 11. Never | 25 |
| | 12. Only news or morning programs | |
| | 13. Only educational programs | |
| | 14. The same amount as commercial television programs | |
| | 15. Usually | |
| 30 | Q4: Do you watch political and economic programs? | 30 |
| | 16. Always | |
| | 17. Usually | |
| | 18. Often | |
| 35 | 19. Sometimes | 35 |
| | 20. Never | |
| | Q5: Do you watch science programs? | |
| | 21. Always | |
| 40 | 22. Usually | 40 |
| | 23. Often | |
| | 24. Sometimes | |
| | 25. Never | |
| 45 | Q6: Do you watch historical programs? | 45 |
| | 26. Always | |
| | 27. Usually | |
| | 28. Often | |
| | 29. Sometimes | |
| 50 | 30. Never | 50 |
| | Q7: Do you watch documentary programs? | |
| | 31. Always | |
| | 32. Usually | |
| 55 | 33. Often | 55 |
| | 34. Sometimes | |
| | 35. Never | |
| 60 | Q8: Do you watch news programs? | 60 |
| | 36. Always | |
| | 37. At least once a day | |
| | 38. Not if a desired program is in the same time interval | |
| | 39. Sometimes | |
| | 40. Never | |

Q9: Do you like performing arts programs?	
41. Like very much	
42. Like somewhat	
43. Indifferent	
5 44. Dislike somewhat	5
45. Dislike very much	
Q10: Do you like sports programs?	
46. Like very much	
10 47. Like somewhat	10
48. Indifferent	
49. Dislike somewhat	
50. Dislike very much	
15 Q11: Do you like "variety talk show" programs?	15
51. Like very much	
52. Like somewhat	
53. Indifferent	
54. Dislike somewhat	
20 55. Dislike very much	20
Q12: Do you like quiz show programs?	
56. Like very much	
57. Like somewhat	
25 58. Indifferent	25
59. Dislike somewhat	
60. Dislike very much	
Q13: Do you like variety show programs?	
30 61. Like very much	30
62. Like somewhat	
63. Indifferent	
64. Dislike somewhat	
65. Dislike very much	
35	35
Q14: Do you like "rock'n' roll" and "foreign pops" musical programs?	
66. Like very much	
67. Like somewhat	
68. Indifferent	
40 69. Dislike somewhat	40
70. Dislike very much	
Q15: Do you like "folk song" and "contemporary singer/song writers or equivalent" musical programs?	
45 71. Like very much	45
72. Like somewhat	
73. Indifferent	
74. Dislike somewhat	
75. Dislike very much	
50	50
Q16: Do you like "classical" musical programs?	
76. Like very much	
77. Like somewhat	
78. Indifferent	
55 79. Dislike somewhat	55
80. Dislike very much	
Q17: Do you like <i>Samurai</i> programs?	
81. Like very much	
60 82. Like somewhat	60
83. Indifferent	
84. Dislike somewhat	
85. Dislike very much	
65 Q18: Do you like "home drama" and comedy programs?	65

86. Like very much	
87. Like somewhat	
88. Indifferent	
89. Dislike somewhat	
5 90. Dislike very much	5
Q19: Do you like suspense and action dramas?	
91. Like very much	
92. Like somewhat	
10 93. Indifferent	10
94. Dislike somewhat	
95. Dislike very much	
Q20: Do you like foreign movies in Japan?	
15 96. Like very much	15
97. Like somewhat	
98. Indifferent	
99. Dislike somewhat	
100. Dislike very much	
20 In the above questionnaire, five selection items are provided for each of 20 questions, so that a total of $20 \times 5 = 100$ items are provided. The 20 questions include questions on family members, age groups, time intervals in which customers do not watch television, and favorite dramas, as well as questions for determining whether the customers prefer NHK programs and news programs, and which program is the most interesting. Each question has five possible	20
25 selection items. The items for linear programming (to be described later) are assigned with numbers as follows. The first question is assigned with P(1) to P(5); the second question with P(6) to P(10); the third question with P(11) to P(15); . . . ; and the twentieth question with P(96) to P(100). The flow chart of the subscriber data registration/retrieval (correction) is shown in Fig. 5.	25
30 (2) TV Program Evaluation Means	30
A TV program evaluation means has the same form as that of the questionnaire described in (1) Subscriber Questionnaire Result Input Means, and is associated with the contents of questions asked of the subscribers for respective TV programs.	
35 -- TV Program Evaluation --	35
E1: Target age group of the TV program	
1. Children of 6 years old or less	
2. Children of 7 to 12 years old	
40 3. Young people	40
4. Middle-aged people	
5. The Elderly	
E2: Political and economic factor	
45 1. Strong	45
2. Moderate	
3. Slight	
4. Very slight	
5. None	
50 E3: Scientific factor	50
1. Strong	
2. Moderate	
3. Slight	
55 4. Very slight	55
5. None	
E4: Historical and educational factor	
1. Strong	
60 2. Moderate	60
3. Slight	
4. Very slight	
5. None	
65 E5: Documentary factor	65

1.	Strong	
2.	Moderate	
3.	Slight	
4.	Very slight	
5 5.	None	5
E6: Factory of news or other information source		
1.	Strong	
2.	Moderate	
10 3.	Slight	10
4.	Very slight	
5.	None	
E7: Factor of show business and gossip		
15 1.	Strong	15
2.	Moderate	
3.	Slight	
4.	Very slight	
5.	None	
20		20
E8: Factor of sports program		
1.	Strong	
2.	Moderate	
3.	Slight	
25 4.	Very slight	25
5.	None	
E9: Factor of variety talk show		
1.	Strong	
30 2.	Moderate	30
3.	Slight	
4.	Very slight	
5.	None	
35	E10: Factor of quiz show program	35
1.	Strong	
2.	Moderate	
3.	Slight	
4.	Very slight	
40 5.	None	40
E11: Factor of variety show		
1.	Strong	
2.	Moderate	
45 3.	Slight	45
4.	Very slight	
5.	None	
E12: Factor of rock'n' roll and pops program		
50 1.	Strong	50
2.	Moderate	
3.	Slight	
4.	Very slight	
5.	None	
55		55
E13: Factor of Japanese pops program		
1.	Strong	
2.	Moderate	
3.	Slight	
60 4.	Very slight	60
5.	None	
E14: Factor of classical music program		
1.	Strong	
65 2.	Moderate	65

3. Slight
4. Very slight
5. None

5 E15: Factor of *Samurai* program

1. Strong
2. Moderate
3. Slight
4. Very slight

10 5. None

5

10

E16: Factor of home drama and comedy program

1. Strong
2. Moderate
3. Slight
4. Very slight
5. None

15

15

E17: Factor of suspense and action drama

1. Strong
2. Moderate
3. Slight
4. Very slight
5. None

20

20

25

E18: Factor of foreign movie in Japan

1. Strong
2. Moderate
3. Slight
4. Very slight
5. None

30

30

The data registration for TV programs is given in the flow chart of Fig. 6.

(3) Linear Programming Means

35 The basic algorithm for linear-programming the evaluations in the above (1) and (2) will be described. The system of the present invention is based on the following algorithm:

35

$$40 \quad P(i) = \sum_{j=1}^n P_c(j) \cdot P(j) \cdot T(i,j) \quad (1)$$

40

where

$P(i)$: the degree of interest of one subscriber for the i th program (the degree is represented by a numeral; the degree given by numeral "0" represents no interest).

45 i : the i th program when the 21 hours from 5 a.m. to 2 a.m. are divided into 15-minute intervals.

45

$P(j)$: representing that the subscriber circles the j th items in the questionnaire. If the subscriber circles item 3 in question 3, $P(11)=P(12)=P(14)=P(15)=0$ and $P(13)=1$.

n : 20 questions \times 5 selection items = 100

50 $T(i,j)$: representing that the j th item of the i th TV program is circled, i and j are given by 1 or 0.

50

$P_c(j)$: an unknown coefficient for $0 \leq P_c(j)$ (having nothing to do with the subscribers)

Equation (1) is a mathematical expression for evaluating a degree of commonness between the subscriber preferences and the TV programs. Coefficient $P_c(j)$ is commonly given for all subscribers. The value of $P_c(j)$ is accurately determined by the feedback of complaints from the subscribers.

55

In order to evaluate commonness between the subscriber preferences and the TV programs, linear programming is represented by an equation of the first degree. The coefficient $P_c(j)$ is a common value for all subscribers. The value of $P_c(j)$ is accurately calculated by feeding back (i.e., learning) complaints from the subscribers, and a detail description thereof will be made later.

60

(4) Data Storage Means and Printout Means

A data storage means according to the present invention is exemplified by a hard disk. Data input to the hard disk is immediately printed out, as shown in the flow chart of Fig. 7. If data for several thousands of subscribers is stored in the hard disk and code numbers are respec-

65

tively assigned to the individual subscribers, an optical program table for each subscriber can be printed out, as shown in Fig. 8. According to a test, it took about 20 minutes to print out each program table after evaluation of the questionnaire if program language FORTRAN was used. The term "print out" does not mean that the program table is finally presented to the corresponding subscriber but that the table is confirmed in processing. The printed program table must be tested. By collecting complaints and feeding them back, a more complete program table can be prepared.

(5) Complaint Processing

As described last in the basic algorithm for the above data processing, the value of $P_c(j)$ is accurately calculated by collecting complaints from the subscribers. An example of complaint reception is given as follows:

Calculation results are given for a given subscriber:

$PI(Tue/19:30)TBS=4.9$ (the degree of interest) 15

$PI(Tue/19:30)NHK=4.8$ (the degree of interest)

where TBS and NHK are Japanese TV broadcasting stations. A proposal for programming station TBS for Tuesday 19:30 is made. Assume that the given subscriber presents a complaint to this proposal in the following manner. 20

" $PI(i1) \geq PI(i2)$ " is not acceptable and

" $PI(i1) < PI(i2)$ " is desired 25

In this case, a difference between the degree of interest for $PI(i2)$ and that for $PI(i1)$ is represented by Y_i . In other words, this is associated with an evaluation of the degree of importance of the complaint. At present, $Y_i = -1$. In this case,

$PI(i2) - \{PI(i1) + Y_i\} \leq 0$ 30

Substitution of equation (1) into the above inequality yields the following inequality:

$\sum_{j=1}^n P_c(j) \cdot P(j) \cdot \{T(i1,j) - T(i2,j)\} - Y_i \leq 0$ 35

Assuming that

$P(j) \cdot \{T(i1,j) - T(i2,j)\} = A_{ij}$ and 40

$P_c(j) = X_j$

the above inequality can be rewritten as: 45

$\sum_{j=1}^n A_{ij} \cdot X_j - Y_i \leq 0$

The right-hand side is then substituted by V_i , so that: 50

$V_i = \sum_{j=1}^n A_{ij} \cdot X_j - Y_i$ 55

X_j is determined to minimize V_i . Assuming only a sum V of positive values V_i (programs causing complaints),

$V = \sum_k^m V_i$ for $V_i > 0$ 60

where m is the total number of V_i components for $V_i > 0$, as many as complaints possible must be received. A minimum V is then calculated to determine the accurate X_j . The above operation 65

is given by the flow chart in Fig. 9.

Referring to Fig. 9, "Search Record" in Processing=1 means search of data for one subscriber. "Input Items Excluding Keyword" indicates the selection items excluding the subscriber name read in *katakana* characters and the date of birth. "New Input" indicates a new subscriber to be registered. However, if the corresponding record is found, i.e., YES, the correct input is entered to update the corresponding value. The flow then advances by selecting an alternative step. In short, in complaint processing, a series of steps from "Initialize Linear Programming" to "Find Countermeasures" are important in Processing=2. More specifically, linear programming initialization is a recalculation of $P_c(j)$. The countermeasures indicate that a $P_c(j)$ value different from the current value is calculated and updates the current value. These mathematical steps are the center of complaint processing, i.e., the learning function. The coefficient $P_c(j)$ can be more accurate to improve prediction precision. Therefore, more suitable programs can be provided to the subscribers.

The steps in the program can be represented by Figs. 11(a), 11(b), 11(c), and 11(d). Since this program is used under copyright, many commands are added thereto.

The embodiment described above exemplifies TV program ratings. However, the method and apparatus of the present invention is not limited to such a particular application. Evaluations can be made according to questionnaires similar to that in the above embodiment. The results are linear-programmed to collect the individual complaints and then to feed them back for processing, thereby further improving prediction precision. In this manner, the present invention can also be applied to surveys other than the embodiment described in this specification.

CLAIMS

1. Apparatus for editing an individual television program table so as to print out a list in units of time intervals and channel numbers in a form optimal for each of a number of subscribers by selecting optimal programs from among a plurality of television programs, comprising:
 - subscriber taste evaluating means for evaluating questionnaires showing subscriber taste in TV programs;
 - television programs evaluating means;
 - processing means for processing results from said subscriber taste and television program evaluating means;
 - storing means for storing processed results;
 - printing means for printing out results in said storage means in the form of an individual subscriber program list; and
 - feedback means for receiving a complaint from a subscriber when the subscriber makes a complaint about the printed program list, and for feeding back the complaint to increase a prediction reliability of a subsequent program list.
2. Apparatus as claimed in claim 1, wherein the feedback means performs a looped operation whose gain is always not less than 1.
3. Apparatus as claimed in claim 1, including a reader unit for reading the printed individual subscriber program list and means for automatically setting a television set or video tape recorder in accordance with output from the reader unit.
4. Apparatus as claimed in claim 3, comprising means for automatically controlling a program rating for a television set or a video tape recorder in accordance with output from the reader unit.
5. A method of editing an individual television program table so as to print out a list in units of time intervals and channel numbers in a form optimal for each of a number of subscribers by selecting optimal programs from among a plurality of television programs, comprising:
 - performing subscriber taste evaluation by evaluating questionnaires showing subscriber taste in TV programs;
 - evaluating television programs by content;
 - processing results of the said subscriber taste and television program evaluation means;
 - storing the processed results;
 - printing out the stored results in the form of an individual subscriber program list; and
 - receiving complaints from subscribers concerning the printed program list, and feeding back the complaints to increase a prediction reliability of a subsequent program list.
6. A method as claimed in claim 5, wherein the feeding back of complaints includes a looped operation whose gain is always not less than 1.
7. A method as claimed in claim 5, comprising automated scanning of the printed individual subscriber program list and automatic setting of a television set or video tape recorder.
8. A method as claimed in claim 5, comprising editing the printed individual subscriber program list to automatically control a program rating of a television set or a video tape recorder while the list is read by a reader unit.
9. Apparatus for editing an individual television program table, substantially as hereinbefore described with reference to and as illustrated in Figs. 2 to 11 of the accompanying drawings.

10. A method of editing an individual television program table, substantially as hereinbefore described with reference to and as illustrated in Figs. 2 to 11 of the accompanying drawings.

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